

10/717,875
.706.003PA*In the Claims:*

Please amend Claims 1 to 20 as follows:

- 1 1. (Currently amended) Process for ultrahigh temperature pasteurization of a
2 liquid food product using a pasteurization arrangement having a first product-to-
3 product regenerative heat exchanger, a first heater stage, a second product-to-
4 product heat exchanger, and a UHT heater stage; comprising the steps of
5 supplying said liquid food product through a raw-product side of said first
6 regenerative heat exchanger to pre-heat same;
7 heating said preheated liquid food product exiting the first heat exchanger to
8 a predetermined intermediate temperature suitable for denaturizing proteins in the
9 liquid food product;
10 flowing the liquid food product at said intermediate temperature through a
11 timing tube to hold the product at said intermediate temperature for a
12 predetermined time suitable sufficient for denaturing said proteins therein;
13 flowing said liquid food product from said timing tube through a raw-
14 product side of said second regenerative heat exchanger to preheat the same from
15 said intermediate temperature to a temperature near a UHT pasteurizing
16 temperature;
17 flowing the liquid food product exiting said second heat exchanger into a
18 liquid medium-to-product heater in said UHT heater stage to heat the liquid food
19 product to a predetermined UHT temperature, the UHT heater stage including
20 means supplying a heating heated liquid medium in counterflow to said product
21 through said liquid medium-to-product heater;

BEST AVAILABLE COPY

10/717,875
706.003PA

22 holding the liquid food product exiting said medium-to-product heater at
23 said UHT temperature for a predetermined length of time;

24 flowing the liquid food product through a pasteurized side of said second
25 regenerative heat exchanger in counterflow to the liquid food product flowing in
26 the raw side thereof to transfer heat to the product flowing in the raw side thereof;

27 flowing the liquid food product exiting the pasteurized side of the second
28 regenerative heat exchanger through a pasteurized side of the first regenerative
29 heat exchanger in counterflow to the liquid food product flowing in the raw side
30 thereof to transfer heat to the product flowing in the raw side thereof; and

31 further processing the liquid food product leaving the pasteurized side of the
32 first regenerative heat exchanger to prepare same for packaging;

33 wherein a temperature differential in the medium-to-product heater between
34 the liquid food product and said heating medium at any every point of reference in
35 the heater is less than 20 degrees F.

1 2. (Currently amended) The process for ultrahigh temperature pasteurization
2 according to Claim 1 wherein the liquid food product has a product volume rate of
3 flow through said liquid medium to product heater and said heated liquid medium
4 has a liquid medium volume rate of flow through said heater, and the ratio of the
5 liquid medium rate of flow to the product rate of flow is below 3:1.

1 3. (Currently amended) The process for ultrahigh temperature pasteurization
2 according to Claim 1 wherein said ratio of liquid medium to product flow rates is

BEST AVAILABLE COPY

10/717,875
706.003PA

3 about 2:1.

1 4. (Original) The process for ultrahigh temperature pasteurization according to
2 Claim 1 wherein the temperature differential in the medium-to-product heater
3 between the product leaving and the medium entering is about 5 degrees F.

1 5. (Original) The process for ultrahigh temperature pasteurization according to
2 Claim 1 wherein the temperature differential in the medium-to-product heater
3 between the product entering and the medium leaving is about 15 degrees F.

1 6. (Currently amended) The process for ultrahigh temperature pasteurization
2 according to Claim 1 wherein the temperature differential in the second
3 regenerative heat exchanger between the product leaving the raw side and the
4 product entering the pasteurized side is about less than 20 degrees F.

1 7. (Currently amended) The process for ultrahigh temperature pasteurization
2 according to Claim 1 wherein said predetermined intermediate temperature at
3 which said denaturing occurs is substantially 175 degrees F.

1 8. (Currently Amended) The process for ultrahigh temperature pasteurization
2 according to Claim 7 wherein said predetermined time that said timing tube holds
3 the product at said intermediate temperature is ~~substantially~~ at least sixty seconds.

BEST AVAILABLE COPY

10/717,875
706.003PA

1 9. (Original) The process for ultrahigh temperature pasteurization according to
2 Claim 1 further comprising passing said product through a homogenizer prior to
3 flowing the same through the raw side of the second regenerative heat exchanger.

1 10. (Original) The process for ultrahigh temperature pasteurization according to
2 Claim 6 wherein said first and second regenerative heat exchangers are tube-in-
3 tube counterflow heat exchangers.

1 11. (Currently amended) Process for ultrahigh temperature pasteurization of a
2 liquid food product using a pasteurization arrangement having a first product-to-
3 product regenerative heat exchanger, a first heater stage, a second product-to-
4 product heat exchanger, and a UHT heater stage; comprising the steps of

5 supplying said liquid food product through a raw-product side of said first
6 regenerative heat exchanger to pre-heat same said preheated liquid food product
7 exiting the first heat exchanger to a predetermined intermediate temperature
8 suitable sufficient for denaturizing proteins in the liquid food product;

9 flowing the liquid food product at said intermediate temperature through a
10 device to hold the product at said intermediate temperature for a predetermined
11 length of time suitable sufficient for denaturing said proteins therein;

12 flowing said liquid food product from said device through a raw-product
13 side of said second regenerative heat exchanger to preheat the same from said
14 intermediate temperature to a temperature near a UHT pasteurizing temperature;

15 flowing the liquid food product exiting said second heat exchanger into a

BEST AVAILABLE COPY

10/717,875
706.003PA

16 liquid medium-to-product heater in said UHT heater stage to heat the liquid food
17 product to a predetermined UHT temperature, the UHT heater stage including
18 means supplying a ~~heating~~ heated liquid medium in counterflow to said product
19 through said liquid medium-to-product heater;

20 holding the liquid food product exiting said liquid medium-to-product
21 heater at said UHT temperature for a predetermined length of time;

22 flowing the liquid food product through a pasturized side of said second
23 regenerative heat exchanger in counterflow to the liquid food product flowing in
24 the raw side thereof to transfer heat to the product flowing in the raw side thereof;

25 flowing the liquid food product exiting the pasteurized side of the second
26 regenerative heat exchanger through a pasteurized side of the first regenerative
27 heat exchanger in counterflow to the liquid food product flowing in the raw side
28 thereof to transfer heat to the product flowing in the raw side thereof; and

29 further processing the liquid food product leaving the pasteurized side of the
30 first regenerative heat exchanger to prepare same for packaging;

31 wherein a temperature differential in the liquid medium-to-product heater
32 between the liquid food product and said ~~heating~~ heated liquid medium at ~~any~~
33 every point of reference in the heater is less than 20 degrees F.

1 12. (Currently Amended) The process for ultrahigh temperature pasteurization
2 according to Claim 11 wherein the liquid food product has a product volume rate
3 of flow through said medium to product heater and said heated liquid medium has
4 a liquid medium volume rate of flow through said heater, and the ratio of the

10/717,875
706.003PA

5 liquid medium rate of flow to the product rate of flow is below 3:1.

1 13. (Currently amended) Process for ultrahigh temperature pasteurization of a
2 liquid food product using a pasteurization arrangement having a product-to-
3 product regenerative heat exchanger and a UHT heater stage; comprising the steps
4 of

5 supplying said liquid food product through a raw-product side of said
6 regenerative heat exchanger to pre-heat same, including denaturizing proteins in
7 the liquid food product, and preheating the liquid food product from said to a
8 temperature near a UHT pasteurizing temperature;

9 flowing the liquid food product exiting said regenerative heat exchanger
10 into a liquid medium-to-product heater in said UHT heater stage to heat the liquid
11 food product to a predetermined UHT temperature, the UHT heater stage
12 including means supplying a ~~heating~~ heated liquid medium in counterflow to said
13 product through said medium to product heater;

14 holding the liquid food product exiting said medium-to-product heater at
15 said UHT temperature for a predetermined length of time;

16 flowing the liquid food product through a pasturized side of said
17 regenerative heat exchanger in counterflow to the liquid food product flowing in
18 the raw side thereof to transfer heat to the product flowing in the raw side thereof;
19 and

20 further processing the liquid food product leaving the pasteurized side of the
21 regenerative heat exchanger to prepare same for packaging;

10/717,875

706.003PA

22 wherein a temperature differential in the medium-to-product heater between
23 the liquid food product and said ~~heating~~ heated liquid medium at any every point
24 of reference in the heater is less than 20 degrees F.

25 14. (Currently Amended) The process for ultrahigh temperature pasteurization
26 according to Claim 13 wherein the liquid food product has a product volume rate
27 of flow through said liquid medium to product heater and said heated liquid
28 medium has a liquid medium volume rate of flow through said heater, and the ratio
29 of the liquid medium rate of flow to the product rate of flow is below 3:1.

1 15. (Currently Amended) The process for ultrahigh temperature pasteurization
2 according to Claim 14 wherein said ratio of heated liquid medium to product flow
3 rates is about 2:1.

1 16. (Currently Amended) The process for ultrahigh temperature pasteurization
2 according to Claim 13 wherein the temperature differential in the medium-to-
3 product heater between the product leaving and the heated liquid medium entering
4 is about 5 degrees F.

1 17. (Currently Amended) The process for ultrahigh temperature pasteurization
2 according to Claim 13 wherein the temperature differential in the medium-to-
3 product heater between the product entering and the heated liquid medium
4 leaving is about 15 degrees F.

10/717,875
706.003PA

1 18. (Currently Amended) The process for ultrahigh temperature pasteurization
2 according to Claim 13 wherein the temperature differential in the regenerative heat
3 exchanger between the product leaving the raw side and the product entering the
4 pasteurized side is about less than 20 degrees F.

1 19. (Currently Amended) The process for ultrahigh temperature pasteurization
2 according to Claim 13 wherein the product flowing through said medium-to-
3 product heater has a flow velocity of below about nine feet per second.

1 20. (Currently Amended) The process for ultrahigh temperature pasteurization
2 according to Claim 19 wherein said flow velocity is no greater than about six feet
3 per second.

1 21. (Withdrawn) In a UHT pasteurizer arrangement comprising a balance tank
2 containing a supply of a liquid food product; a product-to-product regenerative
3 heat exchanger arrangement having a raw product side through which the liquid
4 food product is flowed from the balance tank and a pasteurized side through which
5 pasteurized product is flowed in counterflow relation so that heat is transferred
6 from the pasteurized product to the raw liquid food product to preheat same; a
7 UHT heater stage including a medium-to-product heat exchanger in which the
8 liquid food product leaving the regenerative heat exchanger arrangement enters
9 the medium-to-product heat exchanger where the product is heated to a

10/717,875
706.003PA

predetermined UHT temperature, a holding tube in which the liquid food product leaving the medium-to-product heat exchanger is held at said UHT temperature for a predetermined time, and in which the liquid food product leaving the holding tube enters the pasteurized side of the regenerative heat exchanger arrangement; and means further processing the food product leaving the pasteurized side of the regenerative heat exchanger arrangement to prepare same for packaging; the improvement wherein there is a temperature differential in the medium-to-product heat exchanger between the liquid food product and said heating medium, which at any point of reference therein is less than 20 degrees F.

22. (Withdrawn) UHT pasteurizer arrangement according to Claim 21 wherein the flow rate of product through the medium-to-product heat exchanger and the flow rate of medium therethrough are controlled such that the ratio of medium rate of flow to product rate of flow is below 3:1.

23. (Withdrawn) UHT pasteurizer arrangement according to Claim 21 wherein the temperature differential in the medium-to-product heat exchanger between product leaving and medium entering is about 5 degrees F.

24. (Withdrawn) UHT pasteurizer arrangement according to Claim 21 wherein the temperature differential in the medium-to-product heat exchanger between product entering and medium leaving is about 15 degrees F.

10/717,875
706.003PA

1 25. (Withdrawn) UHT pasteurizer arrangement according to Claim 21 wherein
2 the regenerative heat exchanger arrangement includes first and second stages, and
3 a heater stage situated between said first and second stages, in which liquid food
4 product leaving a raw side of the first stage is heated in a heater to temperature
5 suitable for denaturizing proteins in said liquid food product to prevent the
6 proteins from depositing on walls of the second stage and of the medium-to-
7 product heat exchanger and is held in a timing tube for a predetermined length of
8 time before entering the second stage of the regenerative heat exchanger
9 arrangement.

1 26. (Withdrawn) UHT pasteurizer arrangement according to Claim 25 wherein
2 said predetermined temperature is substantially 175 degrees F and said
3 predetermined length of time is substantially sixty seconds.

1 27. (Withdrawn) UHT pasteurizer arrangement according to Claim 21 in which
2 said regenerative heat exchanger arrangement includes at least one tubular heat
3 exchanger in which an inner tube is mounted coaxially within an outer tube to
4 define counterflow paths for said raw side and said pasteurized side.

1 28. (Withdrawn) UHT pasteurizer arrangement according to Claim 21 in which
2 said medium to product heat exchanger includes a tubular heat exchanger in which
3 an inner tube is mounted coaxially within an outer tube to define counterflow
4 paths for said medium and for said liquid food product.

10/717,875
706.003PA

1 29. (Withdrawn) UHT pasteurizer arrangement according to Claim 21 in which
2 the regenerative heat exchanger is formed as a three-tube heat exchanger with
3 inner, middle, and outer tubes arranged coaxially.

1 30. (Withdrawn) UHT pasteurizer arrangement according to Claim 21 in which
2 the medium to product heat exchanger includes a three-tube tubular heat
3 exchanger with inner, middle, and outer tubes that define an inner passage, an
4 outer annular passage, and a middle annular passage, with the product flowing in
5 the middle annular passage and with the medium flowing counter-currently in the
6 inner and outer passages.